

APPENDIX A
COPC SELECTION PROCESS

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Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
ABCDF	Aberdeen Chemical Agent Disposal Facility
AFA	Agent Filter Area
AFS	Air Filtration System
Agent T (or T)	bis[2-(2-chloroethyl thio) ethyl] ether, or C ₈ H ₁₆ Cl ₂ OS ₂
APG	Aberdeen Proving Ground
BPT	Bechtel Pueblo Team
BRS	Brine Reduction System
BTA	Biotreatment Area
CAS	Chemical Abstracts Service
COPC	Chemical of Potential Concern
DL	detection limit
EDS	Explosive Destruction System
g/g-mol	gram(s) per gram-mole
HCl	hydrochloric acid
HD	sulfur mustard
HT	mixture of approximately 60 percent HD and 40 percent Agent T
ICB™	Immobilized Cell Bioreactor
MPHRA	Multiple Pathway Health Risk Assessment
MTU	Munitions Treatment Unit
OTS	Offgas Treatment System
PCAPP	Pueblo Chemical Agent-Destruction Pilot Plant
PCD	Pueblo Chemical Depot
RCRA	Resource Conservation and Recovery Act
RD&D	Research, Development, and Demonstration
SAIC	Science Applications International Corporation
US	United States
USACHPPM	US Army Center for Health Promotion and Preventative Medicine
WAP	Waste Analysis Plan
WRS	Water Recovery System

A COPC SELECTION PROCESS

Chemicals of potential concern (COPCs) are those chemicals that 1) have been identified as potentially being present in the agent-containing wastes or explosives that will be treated at the Pueblo Chemical Depot (PCD) in the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) or in the Explosive Destruction System (EDS), 2) have been observed in other facilities treating mustard agent using a similar process, or 3) may be generated during the treatment processes at the PCAPP or by the EDS and may become airborne as a result of volatilization or other processes and emitted in a process gas stream. In general, the approach for selecting COPCs is described as follows:

1. Identify possible COPCs from literature that discusses sulfur mustard (bis (2-chloroethyl) sulfide [HD]) components, impurities, and degradation products or other chemicals present in HD munitions.
2. Identify possible COPCs from available data from sources similar to the PCAPP and EDS and from bench-scale evaluations of the processes expected to be located at the PCAPP.
3. Review each possible COPC identified in steps 1 and 2 to determine whether it is expected to be found in a process gas stream.
4. If the chemical could be found in a process gas stream, evaluate the air pollution controls associated with that emission point to determine the likelihood of release of that chemical to the air.

These steps are described in greater detail in the following sections.

A.1 IDENTIFICATION OF POSSIBLE COPCs FROM LITERATURE SOURCES

Table A-1 presents the chemical constituents of the munitions (present in either agent or explosive material), as well as the associated treatment by-products, impurities, and degradation products of HD as identified by the following two sources of information:

1. *Draft Final Munitions Analysis and Characterization Report*, compiled by Science Applications International Corporation (SAIC) for the United States (US) Army PCD, May 2006.

This reference identifies the representative average composition of the munitions (agent and explosive material) stored at stockpile sites, including the PCD, and 45 treatment by-products, impurities, and degradation products of HD determined from analysis of the mustard agent stored at stockpile sites, including the PCD.

Table A-2 herein was developed for the Multiple Pathway Health Risk Assessment (MPHRA) and presents the chemical composition of mustard Agents HD and HT (a mixture of HD with 40 weight percent bis[2-(2-chloroethylthio)ethyl] ether [Agent T]) from the Munitions Analysis and Characterization Report. These data indicate the presence of aluminum, copper, and nickel in the agent that have leached out of the munitions casings, whereas all other identified metals are listed as constituents of the explosive material in the munitions.

2. *The Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products*, authored by representatives from the Life Sciences and Chemical and Analytical Sciences Divisions of Oak Ridge National Laboratory, the US Army Environmental Center, and the US Army Center for Health Promotion and Preventive Medicine

(USACHPPM), *Environmental Health Perspectives*, Vol. 107, Number 12, December 1999 (Munro et al, 1999).

This reference identifies 42 degradation products and impurities of sulfur mustard agent, including synonyms and Chemical Abstracts Service (CAS) numbers. However, inorganic degradation products and well-characterized organic entities such as ethanol and isopropyl alcohol are not listed.

Table A-1. Potential HD/HT Impurities and Treatment and Degradation Products

CAS No.	Chemical Name	Information Source		Source of Chemical		
		Munitions Analysis and Characterization Report	Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products	Treatment & Degradation Product	Products of Mustard Degradation with Age	Impurity from Manufacturing / Present in Ton Containers
630-20-6	1,1,1,2-tetrachloroethane	X			X	
71-55-6	1,1,1-trichloroethane	X			X	
79-34-5	1,1,2,2-tetrachloroethane	X	X		X	X
79-00-5	1,1,2-trichloroethane	X			X	
6669-39-2	1,2,3-trithiolane		X			X
290-81-3	1,2,3,4-tetrathiane		X			X
6576-93-8	1,2,5-trithiepane	X	X			X
3563-36-8	1,2-bis(2-chloroethylthio) ethane	X	X		X	X
5244-34-8	1,2-bis(2-hydroxyethylthio) ethane		X	X		
107-06-2	1,2-dichloroethane	X	X	X	X	X
505-29-3	1,4-dithiane	X	X	X	X	X
15980-15-1	1,4-oxathiane	X	X	X	X	X
118-96-7	2,4,6-trinitrotoluene	X				X
78-86-4	2-chlorobutane	X	X			X
114811-38-0	2-chloroethyl (2-chloroethoxy)ethyl sulfide	X	X			X
71784-01-5	2-chloroethyl 3-chloropropyl sulfide	X	X			X
114811-35-7	2-chloroethyl 4-chlorobutyl sulfide	X	X			X
81142-02-1	2-chloroethyl vinyl sulfide	X	X	X	X	
7327-58-4	2-chloroethyl vinyl sulfone		X	X		
40709-82-8	2-chloroethyl vinyl sulfoxide		X	X		
3090-56-0	2-hydroxyethyl vinyl sulfide	X	X	X	X	
17642-74-9	2-methyl-1,3-oxathiolane		X	X		
7429-90-5	aluminum	X				X
1315-04-4	antimony sulfide	X				X
10022-31-8	barium nitrate	X				X
6865-35-6	barium stearate	X				X
55882-21-8	bis(3-chloropropyl) sulfide	X				X
1002-41-1	bis(2-chloroethyl) disulfide	X	X			X
19149-77-0	bis(2-chloroethyl) trisulfide	X	X			X
22535-54-2	bis(2-chloropropyl) sulfide		X			X
64036-91-5	bis(2-hydroxyethyl)-2-(2-chloroethylthio) ethyl sulfonium chloride		X	X		

**Table A-1. Potential HD/HT Impurities and Treatment and Degradation Products
(continued)**

CAS No.	Chemical Name	Information Source		Source of Chemical		
		Munitions Analysis and Characterization Report	Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products	Treatment & Degradation Product	Products of Mustard Degradation with Age	Impurity from Manufacturing / Present in Ton Containers
64036-92-6	bis(2-hydroxyethyl)-2-(2-hydroxyethylthio) ethyl sulfide		X	X		
64036-79-9	bis-2[bis(2-hydroxyethyl)-sulfonium ethyl] sulfide dichloride	X	X	X	X	
1592-23-0	calcium stearate	X				X
7440-44-0	carbon	X				X
67-66-3	chloroform		X	X		
7440-50-8	copper	X				X
110-81-6	diethyl disulfide	X			X	
84-66-2	diethylphthalate	X				X
84-74-2	di-n-butyl phthalate	X				X
21-14-2	2,4-dinitrotoluene	X				
606-20-2	2,6-dinitrotoluene	X				X
122-39-4	diphenylamine	X				X
627-51-0	divinyl sulfide	X	X	X	X	
77-77-0	divinyl sulfone		X	X		
74-85-1	ethene	X			X	
693-07-2	ethyl 2-chloroethyl sulfide	X			X	
85-98-3	ethyl centralite	X				X
7705-08-0	ferric chloride	X				X
505-60-2	HD	X				X
693-30-1	hemisulfur mustard	X	X	X		
67-72-1	hexachloroethane	X	X			X
7647-01-0	hydrogen chloride	X		X	X	
7783-06-4	hydrogen sulfide	X			X	
115-11-7	isobutylene	X	X			X
13424-46-9	lead azide	X				X
15245-44-0	lead styphnate	X				X
592-87-0	lead thiocyanate	X				X
471-03-4	mustard sulfone		X	X		
5819-08-9	mustard sulfoxide		X	X		
7440-02-0	nickel	X		X		
9004-70-0	nitrocellulose	X				X
55-63-0	nitroglycerin	X				X
3811-04-9	potassium	X				X
7757-79-1	potassium nitrate	X				X
30843-67-5	Q sulfonium		X			X
7647-14-5	sodium chloride	X		X		
63705-05-5	sulfur	X				X
63918-89-8	T		X			X

**Table A-1. Potential HD/HT Impurities and Treatment and Degradation Products
(continued)**

CAS No.	Chemical Name	Information Source		Source of Chemical		
		Munitions Analysis and Characterization Report	Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products	Treatment & Degradation Product	Products of Mustard Degradation with Age	Impurity from Manufacturing / Present in Ton Containers
127-18-4	tetrachloroethene	X	X			X
479-45-8	tetryl	X				X
420-12-2	thiirane	X	X			X
111-48-8	thiodiglycol (TDG)	X	X	X	X	
79-01-6	trichloroethylene	X	X			X
75-01-4	vinyl chloride	X			X	
1115-15-7	vinyl sulfoxide			X	X	
7732-18-5	water	X		X		
NA	(2-chloroethylthio)ethyl (2-hydroxyethylthio) ethyl ether			X	X	X
NA	bis-(2-(2-hydroxyethylthio)ethyl)ether			X	X	X
NA	1,8-dichloro-3-oxa-6-thiaoctane			X		X
NA	sulfur mustard tetrasulfide			X		X
NA	1-oxa-4,5-dithiacycloheptane			X	X	
NA	2,2'-dichlorodiethyl disulfide	X			X	
NA	bis(2-chloroethoxy)-2(2-chloroethylthio)ethane	X			X	

NA - Not available.

References:

- Munitions Analysis and Characterization Report, compiled by SAIC for the US Army Pueblo Chemical Depot, May 2006.
- The Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products, Munro et al, *Environmental Health Perspectives*, Vol. 107, Number 12, December 1999.

Table A-2. Composition of Mustard Agents HD and HT

CAS No.	Chemical Name	HD (wt %)	HT (wt %)
505-60-2	HD	92	53.9
63918-89-8	T	not present	43.7
63705-05-5	free sulfur	7.38	not present
505-29-3	1,4-dithiane	not present	0.47
7705-08-0	ferric chloride	0.5	not present
7647-01-0	hydrochloric acid (HCl)	0.11	not present
1002-41-1	bis(2-chloroethyl) disulfide	not present	0.22
7429-90-5	aluminum	0.01	not present
7440-02-0	0.0025	not present	
7440-50-8	copper	0.0004	not present

Reference: Draft Final Munitions Analysis and Characterization Report, compiled by SAIC for US Army PCD, Pueblo, Colorado, May 2006.

Reference 2 above also identifies the partial and full hydrolysis products of agent T, which are (2-chloroethylthio) ethyl (2-hydroxyethylthio) ethyl ether and bis(2-(2-hydroxyethylthio) ethyl) ether, respectively. The USACHPPM Fact Sheet for Sulfur Mustard Agent HT also states that HT will hydrolyze to form hydrogen chloride and thiodiglycol (USACHPPM, 1998).

In addition to the references cited above, the Waste Analysis Plan (WAP) prepared by the Bechtel Pueblo Team (BPT) for the PCAPP as part of the Resource Conservation and Recovery Act (RCRA) Research, Development, and Demonstration (RD&D) Stage III, Class 3 Permit Modification Request indicated that several types of hazardous waste could potentially be treated at the PCAPP (BPT, 2006). Each waste code includes a number of individual constituents that represent the underlying hazardous characteristics. Table A-3 presents each hazardous waste code and the underlying hazardous constituent/characteristic.

A.2 IDENTIFICATION OF POSSIBLE COPCs FROM SOURCES SIMILAR TO THE PCAPP AND EDS

Sulfur mustard degradation and treatment by-products were identified by BPT in analytical data from liquid and gaseous samples collected during operation of the Aberdeen Chemical Agent Disposal Facility (ABCDF). (The treatment processes at ABCDF were similar to those at the PCAPP; therefore, the ABCDF data was assumed to be representative of operations at the PCAPP.)

Sulfur mustard degradation and treatment by-products were also identified by BPT during the bench-scale evaluation of HD and HT hydrolysis and biotreatment processes for the PCAPP design (Battelle, 2005). Data presented in the bench-scale evaluation of HD and HT hydrolysis and biotreatment processes include the chemical composition of the liquid influent to the Immobilized Cell Bioreactors (ICB™s) (i.e., the diluted hydrolysate), the liquid effluent from the ICB™s (i.e., the liquid effluent to the Brine Reduction System [BRS]), and the gaseous outlet from the ICB™s before any emission controls.

Chemicals also were identified in liquid neutralant samples collected while operating the EDS at Dugway Proving Ground (see Appendix B-2, Section 1) and in exhaust air composition data collected with agent and bare shot EDS testing at Aberdeen Proving Ground (APG). Data from the following sources were used to identify possible COPCs:

- 1) ABCDF storage tank SUMMA canister sample data (similar to the PCAPP 30-day Hydrolysate Storage Tank), collected August 25, 2005, analyzed by Lancaster Laboratories;
- 2) ABCDF stack SUMMA canister sample data, collected July 2003 through October 2004;
- 3) ABCDF hydrolysate sample data, collected July 2003 through October 2004;
- 4) ABCDF bench-scale data (USACHPPM, 2003);
- 5) Munitions headspace composition data from FOCIS Associates, Inc., 2003 (FOCIS, 2003);
- 6) PCAPP Bench-Scale Evaluation of HT, HD, and Energetics (Battelle, 2005);
- 7) EDS liquid neutralant samples; and
- 8) EDS HD and bare shot tests (TRC, 2011; TRC, 2012).

Table A-4 lists all compounds for which samples were analyzed in any of the data sources listed above and indicates in which data set each compound appears.

Table A-3. Hazardous Wastes Potentially Treated at the PCAPP

RCRA Waste Code	Potential Waste Stream	Underlying Hazardous Constituent
D001	Munitions Treatment Unit (MTU) residue, paint waste, waste oils	ignitable waste
D002	Lab waste and spent decontamination solution	corrosive waste
D003	Chemical Agent HD/HT	reactive waste
D004	Chemical Agent HD/HT, agent hydrolysate, dunnage, spent decontamination solution	arsenic
D005	Chemical Agent HD/HT, agent hydrolysate, MTU residue, paint waste, spent decontamination solution	barium
D006	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	cadmium
D007	Chemical Agent HD/HT, agent hydrolysate, paint waste, spent decontamination solution	chromium
D008	Chemical Agent HD/HT, agent hydrolysate, paint waste, spent decontamination solution	lead
D009	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	mercury
D010	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	selenium
D011	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	silver
D018	Agent hydrolysate	benzene
D019	Spent decontamination solution	carbon tetrachloride
D022	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	chloroform
D028	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	1,2-dichloroethane
D034	Chemical Agent HD/HT, spent decontamination solution	hexachloroethane
D037	Dunnage	pentachlorophenol
D039	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	tetrachloroethene
D040	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	trichloroethene
D043	Chemical Agent HD/HT, agent hydrolysate, spent decontamination solution	v vinyl chloride
F001	Waste oils	1,1,1-trichloroethane carbon tetrachloride methylene chloride tetrachloroethene trichloroethene
F002	Paint waste, waste oils	1,1,1-trichloroethane Freon 113 1,1,2-trichloroethane chlorobenzene methylene chloride 1,2-dichlorobenzene tetrachloroethene trichloroethene trichlorofluoromethane
F003	Paint waste	acetone cyclohexanone ethyl acetate ethyl benzene diethyl ether methanol methyl isobutyl ketone n-butyl alcohol xylene
F005	Paint waste	2-ethoxyethanol 2-nitropropane benzene carbon disulfide isobutanol methyl ethyl ketone pyridine toluene
K901	Agent hydrolysate, lab waste, MTU residue, spent decontamination solution, tank, sump, and strainer sludges, Water Recovery System (WRS) solids	waste chemical weapons
K902	Concrete, metallic and non-metallic debris, treated munition bodies	soil, water, debris, or containers contaminated through contact with waste chemical weapons
P909	Chemical Agent HD/HT	HD
P910	Chemical Agent HD/HT	HT

Table A-4. Possible COPCs Identified in Analytical Data from Sources Similar to PCAPP and EDS

CAS No.	Compound Name	Data Source						
		ABCDF Storage Tank SUMMA	ABCDF Stack SUMMA	ABCDF Hydrolysate	ABCDF Bench-scale	Munitions Headspace Composition	PCAPP Bench-scale – ICB™ Offgas	PCAPP Bench-scale – ICB™ Liquid Influent and Effluent
630-20-6	1,1,1,2-tetrachloroethane	X	X		X			
71-55-6	1,1,1-trichloroethane	X	X	X	X			
79-34-5	1,1,2,2-tetrachloroethane	X	X		X	X		
79-00-5	1,1,2-trichloroethane	X	X		X			
75-34-3	1,1-dichloroethane		X		X	X		
75-35-4	1,1-dichloroethene	X	X	X	X		X	X
290-81-3	1,2,3,4-tetrathiane				X			
87-61-6	1,2,3-trichlorobenzene				X		X	X
96-18-4	1,2,3-trichloropropane	X	X	X	X			
526-73-8	1,2,3-trimethyl benzene			X			X	
6669-39-2	1,2,3-trithiolane				X			
120-82-1	1,2,4-trichlorobenzene	X	X		X		X	X
95-63-6	1,2,4-trimethyl benzene	X	X	X	X			
6576-93-8	1,2,5-trithiepane				X			
3563-36-8	1,2-bis(2-chloroethylthio) ethane				X			
5244-34-8	1,2-bis(2-hydroxyethylthio) ethane				X			
NA	1,2-bis(ethylthio)-ethene				X			
NA	1,2-bis(vinylthio)-ethane				X			
96-12-8	1,2-dibromo-3-chloropropane				X		X	
106-93-4	1,2-dibromomethane	X	X					
95-50-1	1,2-dichlorobenzene	X	X		X			X
616-21-7	1,2-dichlorobutane				X	X		
107-06-2	1,2-dichloroethane	X	X	X	X	X	X	X
78-87-5	1,2-dichloropropane	X	X		X		X	X
108-67-8	1,3,5-trimethylbenzene	X	X		X			
106-99-0	1,3-butadiene	X	X				X	X
541-73-1	1,3-dichlorobenzene	X	X	X	X			X
106-46-7	1,4-dichlorobenzene	X	X	X	X			X
123-91-1	1,4-dioxane		X	X			X	X
505-29-3	1,4-dithiane			X	X	X		X
15980-15-1	1,4-oxathiane			X	X	X		X
NA	1,8-dichloro-3-oxa-6-thiaoctane				X			
107-04-0	1-bromo-2-chloro-ethane				X			
109-69-3	1-chlorobutane				X	X		
592-41-6	1-hexene					X		
NA	1-oxa-4,5-dithiacycloheptane				X			
NA	2,2'-dichlorodiethyl disulfide				X			
632-16-6	2,3-dimethyl-thiophene				X			
120-83-2	2,4-dichlorophenol							X
78-93-3	2-butanone	X	X	X	X		X	X
78-86-4	2-chlorobutane					X		

Table A-4. Possible COPCs Identified in Analytical Data from Sources Similar to PCAPP and EDS (continued)

CAS No.	Compound Name	Data Source						
		ABCDF Storage Tank SUMMA	ABCDF Stack SUMMA	ABCDF Hydrolysate	ABCDF Bench-scale	Munitions Headspace Composition	PCAPP Bench-scale – ICB™ Offgas	PCAPP Bench-scale – ICB™ Liquid Effluent and Offgass
112-26-5	2-chloroethoxyethane					X		
114811-38-0	2-chloroethyl (2-chloroethoxy)ethyl sulfide				X			
71784-01-5	2-chloroethyl 3-chloropropyl sulfide				X			
114811-35-7	2-chloroethyl 4-chlorobutyl sulfide				X			
NA	(2-chloroethylthio)ethyl (2-hydroxyethylthio) ethyl ether				X			
81142-02-1	2-chloroethyl vinyl sulfide				X			
7327-58-4	2-chloroethyl vinyl sulfone				X			
40709-82-8	2-chloroethyl vinyl sulfoxide				X			
3404-63-5	2-ethyl 1,3-butadiene					X		
591-78-6	2-hexanone	X	X	X	X		X	
NA	2-hydroxyethyl vinyl chloride				X			
3090-56-0	2-hydroxyethyl vinyl sulfide				X			
95-48-7	2-methyl phenol			X				
5616-51-3	2-methyl-1,3-dithiacyclopentane				X			
6007-26-7	2-methyl-1,3-dithiane				X			
17642-74-9	2-methyl-1,3-oxathiolane				X			
91-57-6	2-methylnaphthalene							X
95-48-7	2-methyl phenol							X
79-46-9	2-nitropropane				X			
107-05-1	3-chloropropene	X	X		X			
108-39-4	3-methyl phenol			X				X
622-96-8	4-ethyltoluene	X	X					
106-44-5	4-methyl phenol			X				X
108-10-1	4-methyl-2-pentanone	X	X	X	X		X	X
208-96-8	acenaphthylene							X
75-07-0	acetaldehyde				X			
67-64-1	acetone	X	X	X	X		X	X
75-05-8	acetonitrile	X	X	X				X
74-86-2	acetylene							X
107-02-8	acrolein	X	X	X				
107-13-1	acrylonitrile	X	X		X			
98-83-9	alpha-methylstyrene	X	X					
7429-90-5	aluminum						X	X
7664-41-7	ammonia							X
7440-36-0	antimony						X	
7440-38-2	arsenic						X	X
7440-39-3	barium						X	
71-43-2	benzene	X	X	X	X		X	X
7440-41-7	beryllium						X	

Table A-4. Possible COPCs Identified in Analytical Data from Sources Similar to PCAPP and EDS (continued)

CAS No.	Compound Name	Data Source						
		ABCDF Storage Tank SUMMA	ABCDF Stack SUMMA	ABCDF Hydrolysate	ABCDF Bench-scale	Munitions Headspace Composition	PCAPP Bench-scale – ICB™ Offgas	PCAPP Bench-scale – ICB™ Liquid Effluent and Effluent
55882-21-8	bis(3-chloropropyl) sulfide				X			
NA	bis-(2-(2-hydroxyethylthio)ethyl)ether				X			
NA	bis(2-chloroethoxy)-2-(2-chloroethylthio)ethane				X			
1002-41-1	bis(2-chloroethyl) disulfide				X			
19149-77-0	bis(2-chloroethyl) trisulfide				X			
39638-32-9	bis(2-chloroisopropyl) ether							X
22535-54-2	bis(2-chloropropyl) sulfide				X			
64036-91-5	bis(2-hydroxyethyl)-2-(2-chloroethylthio)ethyl sulfonium chloride				X			
64036-92-6	bis(2-hydroxyethyl)-2-(2-hydroxyethylthio) ethyl sulfide				X			
63918-89-8	bis[2-(2-chloroethylthio)ethyl] ether				X			
64036-79-9	bis-2[bis(2-hydroxyethyl)-sulfonium ethyl] sulfide dichloride				X			
108-86-1	bromobenzene	X	X		X			
75-27-4	bromodichloromethane	X	X		X			X
75-25-2	bromoform	X	X		X			
74-83-9	bromomethane	X	X		X		X	X
7440-43-9	cadmium						X	X
75-15-0	carbon disulfide	X	X	X	X		X	
56-23-5	carbon tetrachloride	X	X	X	X		X	
108-90-7	chlorobenzene	X	X	X	X			X
75-45-6	chlorodifluoromethane	X	X					
75-00-3	chloroethane	X	X	X	X		X	X
67-66-3	chloroform	X	X	X	X	X	X	X
74-87-3	chloromethane	X	X	X	X		X	X
3188-13-4	chloromethoxyethane					X		
18540-29-9	chromium							X
156-59-2	cis-1,2-dichloroethene	X	X	X	X			X
10061-01-5	cis-1,3-dichloropropene	X	X		X			
7440-50-8	copper						X	X
98-82-8	cumene	X	X	X	X		X	
124-48-1	dibromochloromethane	X	X		X			X
74-95-3	dibromomethane	X	X		X			
75-71-8	dichlorodifluoromethane	X	X	X	X		X	X
75-43-4	dichlorofluoromethane	X	X					
110-81-6	diethyl disulfide				X			
60-29-7	diethyl ether			X	X		X	X
627-51-0	divinyl sulfide				X			
77-77-0	divinyl sulfone				X			
74-84-0	ethane					X		X
64-17-5	ethanol							X

Table A-4. Possible COPCs Identified in Analytical Data from Sources Similar to PCAPP and EDS (continued)

CAS No.	Compound Name	Data Source						
		ABCDF Storage Tank SUMMA	ABCDF Stack SUMMA	ABCDF Hydrolysate	ABCDF Bench-scale	Munitions Headspace Composition	PCAPP Bench-scale – ICB™ Offgas	PCAPP Bench-scale – ICB™ Liquid Influent and Effluent
74-85-1	ethene				X			
693-07-2	ethyl 2-chloroethyl sulfide				X			
141-78-6	ethyl acetate	X	X					
140-88-5	ethyl acrylate	X	X					
97-63-2	ethyl methacrylate	X	X	X	X			
100-41-4	ethylbenzene	X	X	X	X	X		X
75-21-8	ethylene oxide						X	
76-13-1	Freon 113	X	X		X			
76-14-2	Freon 114	X	X		X			
505-60-2	HD					X		X
693-30-1	hemisulfur mustard				X			
142-82-5	heptane	X	X					
87-68-3	hexachlorobutadiene	X	X	X	X	X	X	
67-72-1	hexachloroethane	X	X		X			
110-54-3	hexane	X	X	X				
7647-01-0	hydrogen chloride				X			
74-90-8	hydrogen cyanide							X
7783-06-4	hydrogen sulfide				X			
74-88-4	iodomethane	X	X		X	X		
7439-89-6	iron						X	
115-11-7	isobutylene				X			
540-84-1	isoctane	X	X					
7439-92-1	lead						X	X
7439-97-6	mercury						X	
74-82-8	methane	X	X					X
96-33-3	methyl acrylate	X	X		X			
80-62-6	methyl methacrylate	X	X		X	X		
1634-04-4	methyl tert-butyl ether	X	X	X	X	X		
75-09-2	methylene chloride	X	X	X	X	X	X	X
141-43-5	monoethanolamine							X
471-03-4	mustard sulfone				X			
5819-08-9	mustard sulfoxide				X			
91-20-3	naphthalene			X	X	X	X	X
7440-02-0	nickel						X	
98-95-3	nitrobenzene							X
111-65-9	octane	X	X					
109-66-0	pentane	X	X					
85-01-8	phenanthrene							X
108-95-2	phenol							X
115-07-1	propene	X	X					
129-00-0	pyrene			X				

Table A-4. Possible COPCs Identified in Analytical Data from Sources Similar to PCAPP and EDS (continued)

CAS No.	Compound Name	Data Source								
		ABCDF Storage Tank SUMMA	ABCDF Stack SUMMA	ABCDF Hydrolysate	ABCDF Bench-scale	Munitions Headspace Composition	PCAPP Bench-scale – ICB™ Offgas	PCAPP Bench-scale – ICB™ Liquid Influent and Effluent	EDS Liquid Neutralant	EDS HD and Bare Shot Tests
30843-67-5	Q sulfonium				X					
7782-49-2	selenium							X		
7440-22-4	silver							X	X	
7647-14-5	sodium chloride				X					
100-42-5	styrene	X	X	X	X				X	
63705-05-5	sulfur				X					
NA	sulfur mustard tetrasulfide				X					
75-65-0	tert-butyl alcohol	X	X							
127-18-4	tetrachloroethene	X	X	X	X	X	X	X	X	
7440-28-0	thallium							X		
420-12-2	thiirane				X	X				
111-48-8	thiodiglycol			X						
7440-31-5	tin							X		
108-88-3	toluene	X	X	X	X		X	X	X	
156-60-5	trans-1,2-dichloroethene	X	X		X				X	
10061-02-6	trans-1,3-dichloropropene	X	X		X					
110-57-6	trans-1,4-dichloro-2-butene				X		X			
NA	trans-2,2-dimethyl-thiirane				X					
79-01-6	trichloroethene	X	X	X	X	X		X	X	
75-69-4	trichlorofluoromethane	X	X	X	X		X	X		
108-05-4	vinyl acetate	X	X	X	X					
75-01-4	vinyl chloride	X	X	X	X		X	X	X	
1115-15-7	vinyl sulfoxide				X					
1330-20-7	xylenes	X	X	X	X		X	X	X	
7440-66-6	zinc							X		

A.3 ELIMINATION OF POSSIBLE COPCs

The data for the chemicals identified in Sections A.1 and A.2 provided the basis for grouping and/or eliminating chemicals from the list of possible COPCs. Table A-5 lists the possible COPCs, which are divided into the following groups:

- Group 1 - Metal and Salt Compounds: This group is comprised of metal and salt compounds that were primarily found in ICB™ bench-scale test data or identified in an investigation of potential mercury contamination in the PCD stockpile, but are not expected to be volatilized to any process gas stream. If particulates from PCAPP processes do make it into a process gas stream, they are expected to be controlled by the pollution control train of the Offgas Treatment System (OTS) followed by the Agent Filter Area (AFA). Several of the Group 1 metals were also identified during testing of an EDS unit at APG in Edgewood, Maryland, in 2011 and 2012, while treating both agent and bare shot explosive. Therefore, all metals, salts, and metal compounds were eliminated from further consideration except for those specifically identified during EDS testing. Note, however, that the Air Filtration System (AFS) incorporated into the EDS includes equipment to reduce the releases of metals during operation of the EDS.
- Group 2 - Brominated Compounds: Several brominated compounds were identified in the data from the ABCDF. However, these chemicals were site-specific and are not expected to be present at PCAPP or EDS. Therefore, these chemicals were eliminated from further consideration.
- Group 3 - Components of RCRA Wastes: A number of RCRA wastes were identified as potentially being treated at PCAPP. Each waste code includes a number of individual constituents that represent the underlying hazardous characteristics. Most, but not all, of these constituents have been found in the waste or degradation or treatment by-products. However, several were never identified in any other data source and are not expected to be present at PCAPP. Therefore, these chemicals that were never identified in any other data source were eliminated from further consideration.
- Group 4 – Dioxins, Furans, and Polychlorinated Biphenyls (PCB): This group of chemicals was only detected during a test involving an explosive destruction technology alternative other than an EDS unit. Because EDS is the chosen technology for use at PCD, and these chemicals are not expected in an EDS process gas stream, these chemicals were eliminated from further consideration.
- Group 5 - Non-Detect Compounds: Data were obtained from liquid and gaseous samples collected at ABCDF, as well as bench-scale tests performed for both ABCDF and PCAPP. Many of these samples were analyzed using a specific analytical method, and data were reported only for the analytes specified in the method. However, many of the samples, particularly those collected during the bench-scale testing at ABCDF, were analyzed using a gas chromatograph mass selective detector in full-scan mode, which is capable of detecting any chemical with a molecular weight between approximately 35 to 500 g/g-mol. If a chemical was not identified in the agent, nor was it identified in any of the samples described above, then it is assumed that the chemical was not present or not present at detectable levels. Therefore, these chemicals are not expected in a process gas stream and were eliminated from further consideration.

- Group 6 – Other Explosive Destruction Technology Alternatives Pollutants: This group of chemicals was only detected during a test of technology that did not involve an EDS unit. Because EDS is the chosen technology for use at PCD, and these chemicals are not expected in an EDS process gas stream, these chemicals were eliminated from further consideration.
- Group 7 - Chemicals of Potential Concern (COPCs): These remaining chemicals are considered COPCs and are discussed further in Section A.4. The COPCs included in Group 7 have the following general characteristics based on the current design:
 - Subgroup 7A - Analytes for which high confidence of occurrence exists and emission rates are likely to be greater than their corresponding emission testing detection limit (DL)
 - Subgroup 7B - Analytes for which a reasonable confidence of occurrence exists and emission rates are likely to be less than their corresponding DL
 - Subgroup 7C - Analytes for which low confidence of occurrence exists and for which no reliable emission estimating methodology can be established.

In addition to the other information provided, Table A-5 also indicates the following for each chemical:

- Whether or not the chemical will be emitted in a process gas stream, where:
 - “Y” means yes;
 - “N” means no;
 - “NE” means available information indicates this chemical is **not expected** to be found in this gas stream prior to controls; however it is being carried through the MPHRA as a COPC; and
- Whether or not oral and inhalation toxicity data are available for each COPC in Group 7.

A.4 SELECTION OF COPCs

The list of COPCs presents those chemicals that could be emitted from the PCAPP or EDS operations and may or may not have verifiable toxicity data that can be used for quantitative risk assessment calculations. Table A-5 lists chemicals that have been identified as potentially being present in the agent-containing wastes or explosive materials that will be treated at the PCAPP or in EDS or may be generated during the treatment processes at the PCAPP or EDS. The chemicals listed under Group 7 of Table A-5 may become airborne as a result of volatilization or other processes and emitted in a process gas stream.

Although removal of air pollutants from process offgas at the PCAPP and EDS will consist of multiple stages of activated carbon to remove organics from the offgas, the carbon is optimized for agent removal, which may impact its performance in removing other volatile organic and semi-volatile organic compounds. Therefore, although most of the chemicals presented in Group 7 of Table A-5 will be partially removed by the PCAPP OTS or the EDS AFS, they may not be removed completely and must therefore remain on the list of COPCs.

Table A-6 lists the 104 COPCs and indicates whether or not each has a verifiable toxicity value. Of the 104 COPCs, 30 have carcinogenic toxicity factors, 75 have chronic noncarcinogenic toxicity factors, and 28 COPCs have no chronic toxicity data. Eighty nine (89) COPCs also have acute toxicity factors.

Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer	Non-cancer			
											Inh.	Oral	Inh.	Oral	
GROUP 1: METALS, SALTS, AND METAL COMPOUNDS															
1315-04-4	antimony sulfide	403.9				N				N	N	N	N	N	
7440-39-3	barium	137.3				N				Y	N	N	Y	Y	
10022-31-8	barium nitrate	261.3			N					N	N	N	N	N	
6865-35-6	barium stearate	704.3			N					N	N	N	N	N	
7440-42-8	boron	10.8			N					Y	N	N	Y	Y	
1592-23-0	calcium stearate	607.0			N					N	N	N	N	N	
7440-44-0	carbon	12.0			N					N	N	N	N	N	
16065-83-1	chromium (3+)	52.0			N					Y	N	N	N	Y	
18540-29-9	chromium (6+)	52.0			N					Y	Y	Y	Y	Y	
7440-48-4	cobalt	58.9			N					Y	Y	N	Y	Y	
7705-08-0	ferric chloride	162.2			N					N	N	N	N	N	
7439-89-6	iron	55.8			N					Y	N	N	N	Y	
13424-46-9	lead azide	291.2			N					N	N	N	N	N	
15245-44-0	lead styphnate	450.3			N					N	N	N	N	N	
592-87-0	lead thiocyanate	323.4			N					N	N	N	N	N	
7439-96-5	manganese	54.9			N					Y	N	N	Y	Y	
7723-14-0	phosphorus	31.0			N					Y	N	N	N	Y	
3811-04-9	potassium	122.6			N					N	N	N	N	N	
7757-79-1	potassium nitrate	101.1			N					N	N	N	N	N	
409-21-2	silicon carbide	40.1			N					N	N	N	N	N	
7647-14-5	sodium chloride	58.4			N					N	N	N	N	N	
7440-28-0	thallium	204.4			N					Y	N	N	N	Y	
GROUP 2: BROMINATED COMPOUNDS															
96-12-8	1,2-dibromo-3-chloropropane	236.3			N					Y	Y	Y	Y	Y	
106-93-4	1,2-dibromoethane	187.9			N					Y	Y	Y	Y	Y	
107-04-0	1-bromo-2-chloro-ethane	143.4			N					Y	Y	Y	N	N	
101-55-3	4-bromophenyl phenyl ether	249.1			N					N	N	N	N	N	
108-86-1	bromobenzene	157.0			N					Y	N	N	Y	Y	
75-27-4	bromodichloromethane	163.8			N					Y	Y	Y	N	Y	
75-25-2	bromoform	252.7			N					Y	Y	Y	N	Y	
74-83-9	bromomethane	94.9			N					Y	N	N	Y	Y	
124-48-1	dibromochloromethane	208.3			N					Y	Y	Y	N	Y	
74-95-3	dibromomethane	173.8			N					Y	N	N	Y	Y	
593-60-2	vinyl bromide	107.0			N					Y	N	N	Y	N	

Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
GROUP 3: CHEMICALS PART OF A RCRA WASTE CODE TO POTENTIALLY BE TREATED															
96231-36-6	2-ethoxyethanol	90.1				N				Y	N	N	Y	Y	
79-46-9	2-nitropropane	89.1				N				Y	Y	N	Y	N	
108-94-1	cyclohexanone	98.1				N				Y	N	N	Y	Y	
78-83-1	isobutanol	74.1				N				Y	N	N	N	Y	
67-56-1	methanol	32.0				N				Y	N	N	Y	Y	
71-36-3	n-butyl alcohol	74.1				N				Y	N	N	N	Y	
110-86-1	pyridine	79.1				N				Y	N	N	N	Y	
GROUP 4: DIOXINS, FURANS, AND PCBs															
1746-01-6	2,3,7,8-TCDD	322.0				N				Y	Y	Y	Y	Y	
40321-76-4	1,2,3,7,8-PeCDD	356.4				N				Y	Y	Y	N	N	
39227-28-6	1,2,3,4,7,8-HxCDD	390.8				N				Y	Y	Y	N	N	
57653-85-7	1,2,3,6,7,8-HxCDD	390.8				N				Y	Y	Y	N	N	
19408-74-3	1,2,3,7,8,9-HxCDD	390.8				N				Y	Y	Y	N	N	
35822-46-9	1,2,3,4,6,7,8-HpCDD	425.3				N				N	N	N	N	N	
3268-87-9	1,2,3,4,6,7,8,9-OCDD	459.7				N				Y	Y	Y	N	N	
51207-31-9	2,3,7,8-TCDF	306.0				N				Y	Y	Y	N	N	
57117-41-6	1,2,3,7,8-PeCDF	340.4				N				Y	Y	Y	N	N	
57117-31-4	2,3,4,7,8-PeCDF	340.4				N				Y	Y	Y	N	N	
70648-26-9	1,2,3,4,7,8-HxCDF	374.8				N				Y	Y	Y	N	N	
57117-44-9	1,2,3,6,7,8-HxCDF	374.8				N				Y	Y	Y	N	N	
72918-21-9	1,2,3,7,8,9-HxCDF	374.8				N				Y	Y	Y	N	N	
60851-34-5	2,3,4,6,7,8-HxCDF	374.8				N				Y	Y	Y	N	N	
67562-39-4	1,2,3,4,6,7,8-HpCDF	409.3				N				Y	Y	Y	N	N	
55673-89-7	1,2,3,4,7,8,9-HpCDF	409.3				N				Y	Y	Y	N	N	
39001-02-0	1,2,3,4,6,7,8,9-OCDF	443.7				N				Y	Y	Y	N	N	
70362-50-4	3,4,4',5-TCB (PCB 81)	292.0				N				Y	Y	Y	Y	Y	
32598-13-3	3,3',4,4'-TCB (PCB 77)	292.0				N				Y	Y	Y	Y	Y	
57465-28-8	3,3',4,4',5-PeCB (PCB 126)	326.4				N				Y	Y	Y	Y	Y	
32774-16-6	3,3',4,4',5,5'-HxCB (PCB 169)	360.9				N				Y	Y	Y	Y	Y	
65510-44-3	2',3,4,4',5-PeCB (PCB 123)	326.4				N				Y	Y	Y	Y	Y	
31508-00-6	2,3',4,4',5-PeCB (PCB 118)	326.4				N				Y	Y	Y	Y	Y	
32598-14-4	2,3,3',4,4'-PeCB (PCB 105)	326.4				N				Y	Y	Y	Y	Y	
74472-37-0	2,3,4,4',5-PeCB (PCB 114)	326.4				N				Y	Y	Y	Y	Y	
52663-72-6	2,3',4,4',5,5'-HxCB (PCB 167)	360.9				N				Y	Y	Y	Y	Y	
38380-08-4	2,3,3',4,4',5-HxCB (PCB 156)	360.9				N				Y	Y	Y	Y	Y	
69782-90-7	2,3,3',4,4',5'-HxCB (PCB 157)	360.9				N				Y	Y	Y	Y	Y	
39635-31-9	2,3,3',4,4',5,5'-HpCB (PCB 189)	395.3				N				Y	Y	Y	Y	Y	
GROUP 5: UNDETECTED CHEMICALS															
NA	(2-chloroethylthio)ethyl(2-hydroxyethylthio)ethylether	244.8				N				N	N	N	N	N	
79-00-5	1,1,2-trichloroethane	133.4				N				Y	Y	Y	Y	Y	
290-81-3	1,2,3,4-tetrathiane	156.3				N				N	N	N	N	N	
96-18-4	1,2,3-trichloropropane	147.4				N				Y	N	Y	Y	Y	
526-73-8	1,2,3-trimethylbenzene	120.2				N				Y	N	N	Y	N	
6669-39-2	1,2,3-trithiolane	124.3				N				N	N	N	N	N	
95-94-3	1,2,4,5-tetrachlorobenzene	215.9				N				Y	N	N	N	Y	

Y = yes; N = no; NE = not expected (This COPC is considered a Subgroup 7C COPC and is not expected to be emitted but is being carried through the MPHRA at this time.)

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Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
6576-93-8	1,2,5-trithiepane	152.3					N			N	N	N	N	N	
3563-36-8	1,2-bis(2-chloroethylthio)ethane	219.2					N			N	N	N	N	N	
5244-34-8	1,2-bis(2-hydroxyethylthio)ethane	182.3					N			N	N	N	N	N	
122-66-7	1,2-diphenylhydrazine	184.2					N			Y	Y	Y	N	N	
108-67-8	1,3,5-trimethylbenzene	120.2					N			Y	N	N	N	Y	
99-35-4	1,3,5-trinitrobenzene	213.1					N			Y	N	N	N	Y	
106-99-0	1,3-butadiene	54.1					N			Y	Y	Y	Y	N	
99-65-0	1,3-dinitrobenzene	168.1					N			Y	N	N	N	Y	
130-15-4	1,4-naphthoquinone	158.2					N			N	N	N	N	N	
106-50-3	1,4-phenylenediamine	108.1					N			N	N	N	N	N	
NA	1,8-dichloro-3-oxa-6-thiaoctane	203.1					N			N	N	N	N	N	
90-13-1	1-chloronaphthalene	162.6					N			N	N	N	N	N	
134-32-7	1-naphthylamine	143.2					N			N	N	N	N	N	
NA	1-oxa-4,5-dithiacycloheptane	136.2					N			N	N	N	N	N	
540-84-1	2,2,4-trimethylpentane	114.2					N			N	N	N	N	N	
NA	2,2'-dichlorodiyethyl disulfide	191.1					N			N	N	N	N	N	
58-90-2	2,3,4,6-tetrachlorophenol	231.9					N			N	N	N	N	N	
95-95-4	2,4,5-trichlorophenol	197.5					N			Y	N	N	N	Y	
88-06-2	2,4,6-trichlorophenol	197.5					N			Y	Y	Y	N	Y	
105-67-9	2,4-dimethylphenol	122.2					N			N	N	N	N	N	
51-28-5	2,4-dinitrophenol	184.1					N			N	N	N	N	N	
87-65-0	2,6-dichlorophenol	163.0					N			N	N	N	N	N	
53-96-3	2-acetylaminofluorene	223.3					N			N	N	N	N	N	
114811-38-0	2-chloroethyl(2-chloroethoxy)ethylsulfide	203.1					N			N	N	N	N	N	
71784-01-5	2-chloroethyl3-chloropropylsulfide	173.1					N			N	N	N	N	N	
114811-35-7	2-chloroethyl4-chlorobutylsulfide	187.1					N			N	N	N	N	N	
81142-02-1	2-chloroethylvinylsulfide	122.6					N			N	N	N	N	N	
7327-58-4	2-chloroethylvinylsulfone	154.6					N			N	N	N	N	N	
40709-82-8	2-chloroethylvinylsulfoxide	138.6					N			N	N	N	N	N	
91-58-7	2-chloronaphthalene	162.6					N			Y	N	N	N	Y	
95-57-8	2-chlorophenol	128.6					N			N	N	N	N	N	
75-29-6	2-chloropropane	78.5					N			N	N	N	N	N	
NA	2-hydroxyethylvinylchloride	unknown					N			N	N	N	N	N	
3090-56-0	2-hydroxyethylvinylsulfide	104.2					N			N	N	N	N	N	
99-55-8	2-methyl-5-nitroaniline	152.2					N			N	N	N	N	N	
91-59-8	2-naphthylamine	143.2					N			N	N	N	N	N	
88-74-4	2-nitroaniline	138.1					N			N	N	N	N	N	
88-75-5	2-nitrophenol	139.1					N			N	N	N	N	N	
109-06-8	2-picoline	93.1					N			N	N	N	N	N	
67-63-0	2-propanol	60.1					N			N	N	N	N	N	
88-85-7	2-sec-butyl-4,6-dinitro-phenol	240.2					N			N	N	N	N	N	
91-94-1	3,3'-dichlorobenzidine	253.1					N			Y	Y	Y	N	N	
119-93-7	3,3'-dimethylbenzidine	212.3					N			N	N	N	N	N	
132-32-1	3-amino-9-ethylcarbazole	210.3					N			N	N	N	N	N	
107-05-1	3-chloropropene	76.5					N			Y	Y	Y	Y	N	
56-49-5	3-methylcholanthrene	268.4					N			N	N	N	N	N	
99-09-2	3-nitroaniline	138.1					N			N	N	N	N	N	
72-55-9	4,4'-DDE	318.0					N			N	N	N	N	N	

Y = yes; N = no; NE = not expected (This COPC is considered a Subgroup 7C COPC and is not expected to be emitted but is being carried through the MPHRA at this time.)

Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
534-52-1	4,6-dinitro-2-methylphenol	198.1					N			N	N	N	N	N	
92-67-1	4-aminobiphenyl	169.2					N			N	N	N	N	N	
59-50-7	4-chloro-3-methylphenol	142.6					N			N	N	N	N	N	
106-47-8	4-chloroaniline	127.6					N			Y	N	Y	N	Y	
7005-72-3	4-chlorophenylphenylether	204.7					N			N	N	N	N	N	
622-96-8	4-ethyltoluene	120.2					N			N	N	N	N	N	
100-01-6	4-nitroaniline	138.1					N			N	N	N	N	N	
100-02-7	4-nitrophenol	139.1					N			N	N	N	N	N	
56-57-5	4-nitroquinoline-1-oxide	190.2					N			N	N	N	N	N	
602-87-9	5-nitroacenaphthene	199.2					N			N	N	N	N	N	
57-97-6	7,12-dimethylbenz(a)-anthracene	256.3					N			N	N	N	N	N	
122-09-8	a,a-dimethylphenethyl-amine	149.2					N			N	N	N	N	N	
83-32-9	acenaphthene	154.2					N			N	N	N	N	N	
75-05-8	acetonitrile	41.1					N			Y	N	N	Y	N	
98-86-2	acetophenone	120.2					N			N	N	N	N	N	
107-13-1	acrylonitrile	53.1					N			Y	Y	Y	Y	Y	
100-44-7	alpha-chlorotoluene	126.6					N			N	N	N	N	N	
62-53-3	aniline	93.1					N			N	N	N	N	N	
120-12-7	anthracene	178.2					N			Y	N	N	N	Y	
140-57-8	aramite	334.9					N			N	N	N	N	N	
100-52-7	benzaldehyde	106.1					N			N	N	N	N	N	
108-98-5	benzenethiol	110.2					N			N	N	N	N	N	
92-87-5	benzidine	184.2					N			N	N	N	N	N	
56-55-3	benzo(a)anthracene	228.3					N			N	N	N	N	N	
50-32-8	benzo(a)pyrene	252.3					N			N	N	N	N	N	
205-99-2	benzo(b)fluoranthrene	252.3					N			N	N	N	N	N	
192-97-2	benzo(e)pyrene	252.3					N			N	N	N	N	N	
191-24-2	benzo(g,h,i)perylene	276.3					N			N	N	N	N	N	
205-82-3	benzo(j)fluoranthrene	252.3					N			N	N	N	N	N	
207-08-9	benzo(k)fluoranthrene	252.3					N			N	N	N	N	N	
92-52-4	biphenyl	154.2					N			N	N	N	N	N	
55882-21-8	bis (3-chloropropyl) sulfide	187.1					N			N	N	N	N	N	
NA	bis-(2-(2-hydroxyethylthio)ethyl)ether	226.4					N			N	N	N	N	N	
NA	bis(2-chloroethoxy)-2-(2-chloroethylthio)ethane	296.7					N			N	N	N	N	N	
111-91-1	bis(2-chloroethoxy)-methane	173.0					N			N	N	N	N	N	
1002-41-1	bis(2-chloroethyl) disulfide	191.1					N			N	N	N	N	N	
111-44-4	bis(2-chloroethyl) ether	143.0					N			N	N	N	N	N	
19149-77-0	bis(2-chloroethyl) trisulfide	223.2					N			N	N	N	N	N	
22535-54-2	bis(2-chloropropyl) sulfide	187.1					N			N	N	N	N	N	
117-81-7	bis(2-ethylhexyl)-phthalate	390.6					N			Y	Y	Y	N	Y	
64036-91-5	bis(2-hydroxyethyl)-2-(2-chloroethylthio)ethyl sulfonium chloride	246.8					N			N	N	N	N	N	
64036-92-6	bis(2-hydroxyethyl)-2-(2-hydroxyethylthio)ethyl sulfide	227.4					N			N	N	N	N	N	
63918-89-8	bis[2-(2-chloroethylthio)ethyl] ether	263.3					N			N	N	N	N	N	
64036-79-9	bis-2[bis(2-hydroxyethyl)-sulfonium ethyl] sulfide dichloride	332.6					N			N	N	N	N	N	
85-68-7	butyl benzyl phthalate	312.4					N			N	N	N	N	N	

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Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
510-15-6	chlorobenzilate	325.2					N			N	N	N	N	N	
75-45-6	chlorodifluoromethane	86.5					N			Y	N	N	Y	N	
218-01-9	chrysene	228.3					N			N	N	N	N	N	
98-82-8	cumene	120.2					N			Y	N	N	Y	Y	
110-82-7	cyclohexane	84.2					N			N	N	N	N	N	
2303-16-4	diallate	270.2					N			N	N	N	N	N	
224-42-0	dibenz(a,j)acridine	279.3					N			N	N	N	N	N	
53-70-3	dibenzo(a,h)anthracene	278.3					N			N	N	N	N	N	
132-64-9	dibenzofuran	168.2					N			N	N	N	N	N	
75-43-4	dichlorofluoromethane	102.9					N			N	N	N	N	N	
110-81-6	diethyl disulfide	122.3					N			N	N	N	N	N	
94-58-6	dihydrosafrole	164.2					N			N	N	N	N	N	
1445-75-6	disopropylmethylphosphonate	180.2					N			N	N	N	N	N	
131-11-3	dimethyl phthalate	194.2					N			N	N	N	N	N	
78-34-2	dioxathion	456.5					N			N	N	N	N	N	
627-51-0	divinyl sulfide	86.2					N			N	N	N	N	N	
77-77-0	divinyl sulfone	118.2					N			N	N	N	N	N	
693-07-2	ethyl 2-chloroethyl sulfide	124.6					N			N	N	N	N	N	
141-78-6	ethyl acetate	88.1					N			N	N	N	N	N	
140-88-5	ethyl acrylate	100.1					N			Y	N	Y	N	N	
97-63-2	ethyl methacrylate	114.1					N			Y	N	N	Y	Y	
62-50-0	ethyl methanesulfonate	124.2					N			N	N	N	N	N	
75-21-8	ethylene oxide	44.1					N			Y	Y	Y	Y	N	
206-44-0	fluoranthene	202.3					N			Y	N	N	N	Y	
86-73-7	fluorene	166.2					N			N	N	N	N	N	
76-13-1	Freon 113	187.4					N			Y	N	N	Y	Y	
76-14-2	Freon 114	170.9					N			N	N	N	N	N	
693-30-1	hemisulfur mustard	140.6					N			N	N	N	N	N	
76-44-8	heptachlor	373.3					N			N	N	N	N	N	
142-82-5	heptane	100.2					N			N	N	N	N	N	
118-74-1	hexachlorobenzene	284.8					N			Y	Y	Y	N	Y	
77-47-4	hexachlorocyclopentadiene	272.8					N			N	N	N	N	N	
70-30-4	hexachlorophene	406.9					N			N	N	N	N	N	
1888-71-7	hexachloropropene	248.8					N			N	N	N	N	N	
2691-41-0	HMX	296.2					N			Y	N	N	N	Y	
7664-39-3	hydrogen fluoride	20.0					N			Y	N	N	Y	Y	
7783-06-4	hydrogen sulfide	34.1					N			Y	N	N	Y	N	
193-39-5	indeno(1,2,3-cd)pyrene	276.3					N			N	N	N	N	N	
74-88-4	iodomethane	141.9					N			N	N	N	N	N	
115-11-7	isobutylene	56.1					N			N	N	N	N	N	
540-84-1	isooctane	114.2					N			N	N	N	N	N	
78-59-1	isophorone	138.2					N			N	N	N	N	N	
120-58-1	isosafrole	162.2					N			N	N	N	N	N	
91-80-5	methaphyrilene	261.4					N			N	N	N	N	N	
72-43-5	methoxychlor	345.6					N			N	N	N	N	N	
96-33-3	methyl acrylate	86.1					N			Y	N	N	Y	Y	
80-62-6	methyl methacrylate	100.1					N			Y	N	N	Y	Y	
66-27-3	methyl methanesulfonate	110.1					N			N	N	N	N	N	

Y = yes; N = no; NE = not expected (This COPC is considered a Subgroup 7C COPC and is not expected to be emitted but is being carried through the MPHRA at this time.)

Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
298-00-0	methyl parathion	263.2					N			N	N	N	N	N	
108-87-2	methylcyclohexane	98.2					N			N	N	N	N	N	
471-03-4	mustard sulfone	191.1					N			N	N	N	N	N	
5819-08-9	mustard sulfoxide	175.1					N			N	N	N	N	N	
693-13-0	N,N-diisopropylcarbodiimide	126.2					N			N	N	N	N	N	
9004-70-0	nitrocellulose	252.1					N			N	N	N	N	N	
3760-55-2	N-nitropyrrrolidine	116.1					N			N	N	N	N	N	
55-18-5	N-nitrosodiethylamine	102.1					N			N	N	N	N	N	
62-75-9	N-nitrosodimethylamine	74.1					N			N	N	N	N	N	
924-16-3	N-nitroso-di-n-butylamine	158.2					N			N	N	N	N	N	
621-64-7	N-nitroso-di-n-propylamine	130.2					N			N	N	N	N	N	
86-30-6	N-nitrosodiphenylamine	198.2					N			Y	Y	Y	N	N	
10595-95-6	N-nitrosomethylamine	88.1					N			N	N	N	N	N	
59-89-2	N-nitrosomorpholine	116.1					N			N	N	N	N	N	
100-75-4	N-nitrosopiperidine	114.1					N			N	N	N	N	N	
95-53-4	o-toluidine	107.2					N			N	N	N	N	N	
60-11-7	p-dimethylaminoazobenzene	225.3					N			N	N	N	N	N	
608-93-5	pentachlorobenzene	250.3					N			N	N	N	N	N	
76-01-7	pentachloroethane	202.3					N			N	N	N	N	N	
82-68-8	pentachloronitrobenzene	295.3					N			N	N	N	N	N	
87-86-5	pentachlorophenol	266.3					N			Y	Y	Y	N	Y	
198-55-0	perylene	252.3					N			N	N	N	N	N	
62-44-2	phenacetin	179.2					N			N	N	N	N	N	
23950-58-5	pronamide	256.1					N			N	N	N	N	N	
74296-31-4	propylbenzene	120.2					N			Y	N	N	Y	Y	
106-49-0	p-toluidine	107.2					N			N	N	N	N	N	
129-00-0	pyrene	202.3					N			Y	N	N	N	Y	
110-86-1	pyridine	79.1					N			N	N	N	N	N	
30843-67-5	Q sulfonium	219.2					N			N	N	N	N	N	
91-22-5	quinoline	129.2					N			N	N	N	N	N	
94-59-7	safrole	162.2					N			N	N	N	N	N	
63705-05-5	sulfur	32.1					N			N	N	N	N	N	
NA	sulfur mustard tetrasulfide	255.3					N			N	N	N	N	N	
109-99-9	tetrahydrofuran	72.1					N			N	N	N	N	N	
110-57-6	trans-1,4-dichloro-2-butene	125.0					N			N	N	N	N	N	
102-82-9	tributylamine	185.4					N			N	N	N	N	N	
108-05-4	vinyl acetate	86.1					N			Y	N	N	Y	Y	
1115-15-7	vinyl sulfoxide	102.2					N			N	N	N	N	N	
7440-24-6	strontium	87.6					N			Y	N	N	N	Y	
7440-29-1	thorium	232.0					N			N	N	N	N	N	
GROUP 6: OTHER EXPLOSIVE DESTRUCTION TECHNOLOGY ALTERNATIVES POLLUTANTS															
65-85-0	benzoic acid	122.1					N			Y	N	N	N	Y	
100-51-6	benzyl alcohol	108.1					N			Y	N	N	N	Y	
106-97-8	butane	58.1					N			N	N	N	N	N	
56-23-5	carbon tetrachloride	154.8					N			Y	Y	Y	Y	Y	
10061-01-5	cis-1,3-dichloropropene	111.0					N			N	N	N	N	N	
117-84-0	di-n-octyl phthalate	390.6					N			Y	N	N	N	Y	
74-98-6	propane	44.1					N			N	N	N	N	N	

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Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
121-82-4	RDX	222.1					N			Y	N	Y	N	Y	
10061-02-6	trans-1,3-dichloropropene	111.0					N			N	N	N	N	N	
75-69-4	trichlorofluoromethane	137.4					N			Y	N	N	Y	Y	
7440-36-0	antimony	121.8					N			Y	N	N	N	Y	
7440-41-7	beryllium	9.0					N			Y	Y	Y	Y	Y	
7487-94-7	mercuric chloride	271.5					N			Y	N	N	Y	Y	
22967-92-6	methyl mercury	215.6					N			Y	N	N	N	Y	
7439-97-6	elemental mercury	200.6					N			Y	N	N	Y	N	
7782-49-2	selenium	79.0					N			Y	N	N	Y	Y	
7440-31-5	tin	118.7					N			Y	N	N	N	Y	
7440-62-2	vanadium	50.9					N			Y	N	N	Y	Y	
7440-66-6	zinc	65.4					N			Y	N	N	N	Y	
GROUP 7: COPCs															
630-20-6	1,1,1,2-tetrachloroethane	167.9	X	X	NE	NE	NE	NE	NE	Y	Y	Y	N	Y	
71-55-6	1,1,1-trichloroethane	133.4	X	X	NE	NE	NE	NE	NE	Y	N	N	Y	Y	
79-34-5	1,1,2,2-tetrachloroethane	167.9	X	X	Y	Y	Y	Y	NE	Y	Y	Y	N	Y	
75-34-3	1,1-dichloroethane	99.0	X		Y	Y	Y	Y	N	Y	Y	Y	N	Y	
75-35-4	1,1-dichloroethene	96.9	X	X	NE	NE	NE	NE	Y	Y	N	N	Y	Y	
87-61-6	1,2,3-trichlorobenzene	181.5	X		Y	Y	Y	Y	N	Y	N	N	N	Y	
120-82-1	1,2,4-trichlorobenzene	181.4	X	X	NE	NE	NE	NE	NE	Y	Y	N	Y	Y	
95-63-6	1,2,4-trimethyl benzene	120.2	X		Y	N	N	N	N	Y	N	N	Y	N	
13105-10-7	1,2-bis(ethylthio)-ethene	148.3	X		NE	NE	NE	NE	NE	N	N	N	N	N	
63938-34-1	1,2-bis(vinylthio)-ethane	146.3	X		NE	NE	NE	NE	NE	N	N	N	N	N	
95-50-1	1,2-dichlorobenzene	147.0		X	N	N	N	N	N	Y	Y	N	N	Y	
616-21-7	1,2-dichlorobutane	127.0	X		Y	Y	Y	Y	Y	N	N	N	N	N	
107-06-2	1,2-dichloroethane	99.0	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
78-87-5	1,2-dichloropropane	113.0	X		Y	Y	Y	Y	Y	N	Y	Y	Y	Y	
541-73-1	1,3-dichlorobenzene	147.0		X	N	N	N	N	N	Y	N	N	N	N	
106-46-7	1,4-dichlorobenzene	147.0		X	N	N	N	N	N	Y	Y	Y	Y	Y	
123-91-1	1,4-dioxane	88.1	X		NE	NE	NE	NE	NE	N	Y	Y	Y	Y	
505-29-3	1,4-dithiane	120.2	X	X	Y	Y	Y	Y	Y	Y	N	N	N	Y	
15980-15-1	1,4-oxathiane	104.2	X	X	Y	Y	Y	Y	Y	N	N	N	N	N	
109-69-3	1-chlorobutane	92.6	X		Y	Y	Y	Y	N	Y	N	N	N	Y	
592-41-6	1-hexene	84.2	X		Y	Y	Y	Y	N	N	N	N	N	N	
3772-13-2	2,2-dimethyl-trans-thiirane	88.2	X		NE	NE	NE	NE	NE	N	N	N	N	N	
632-16-6	2,3-dimethyl-thiophene	112.2	X		NE	NE	NE	NE	NE	N	N	N	N	N	
118-96-7	2,4,6-trinitrotoluene	227.1		X	N	N	N	N	NE	Y	N	Y	N	Y	
120-83-2	2,4-dichlorophenol	163.0		X	N	N	N	N	Y	Y	N	N	N	Y	
121-14-2	2,4-dinitrotoluene	182.1		X	N	N	N	N	NE	Y	Y	Y	N	Y	
606-20-2	2,6-dinitrotoluene	182.1		X	N	N	N	N	NE	Y	N	Y	N	Y	
78-93-3	2-butanone	72.1	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
78-86-4	2-chlorobutane	92.6	X	X	Y	Y	Y	Y	NE	N	N	N	N	N	
112-26-5	2-chloroethoxyethane	187.1	X		Y	Y	Y	Y	N	N	N	N	N	N	
3404-63-5	2-ethyl 1,3-butadiene	82.1	X		Y	Y	Y	Y	N	N	N	N	N	N	
591-78-6	2-hexanone	72.1	X		Y	Y	Y	Y	N	Y	Y	N	Y	Y	
95-48-7	2-methyl phenol	108.1		X	N	N	N	N	Y	Y	N	N	Y	Y	
5616-51-3	2-methyl-1,3-dithiacyclopentane	120.2	X		NE	NE	NE	NE	NE	N	N	N	N	N	
6007-26-7	2-methyl-1,3-dithiane	134.3	X		NE	NE	NE	NE	NE	N	N	N	N	N	

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Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
17642-74-9	2-methyl-1,3-oxathiolane	104.2	X		NE	NE	NE	NE	N	N	N	N	N	N	
91-57-6	2-methylnaphthalene	142.2		X	N	N	N	N	Y	Y	N	N	N	Y	
108-39-4	3-methyl phenol	108.1	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
106-44-5	4-methyl phenol	108.1	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
108-10-1	4-methyl-2-pentanone	100.2	X		Y	Y	Y	Y	N	Y	N	N	Y	Y	
208-96-8	acenaphthylene	152.2		X	N	N	N	N	Y	N	N	N	N	N	
75-07-0	acetaldehyde	44.1	X		NE	NE	NE	NE	N	Y	Y	Y	Y	N	
67-64-1	acetone	58.1	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
74-86-2	acetylene	26.0		X	N	N	N	N	NE	N	N	N	N	N	
107-02-8	acrolein	56.1	X		Y	N	N	N	N	Y	N	N	Y	Y	
98-83-9	alpha-methylstyrene	118.0	X		Y	N	N	N	N	Y	N	N	N	Y	
71-43-2	benzene	78.1	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
108-60-1	bis(2-chloroisopropyl) ether	171.1		X	N	N	N	N	Y	Y	Y	Y	N	Y	
75-15-0	carbon disulfide	76.1	X	X	Y	N	N	N	Y	Y	N	N	Y	Y	
108-90-7	chlorobenzene	112.6		X	N	N	N	N	Y	Y	N	N	Y	Y	
75-00-3	chloroethane	64.5	X		Y	N	N	N	N	Y	N	N	Y	N	
67-66-3	chloroform	119.4	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
74-87-3	chloromethane	50.5	X		Y	Y	Y	Y	N	Y	N	N	Y	N	
3188-13-4	chloromethoxyethane	94.5	X		Y	N	Y	N	N	N	N	N	N	N	
156-59-2	cis-1,2-dichloroethene	96.9		X	N	N	N	N	Y	Y	N	N	N	Y	
75-71-8	dichlorodifluoromethane	120.9		X	N	N	N	N	Y	Y	N	N	Y	Y	
60-29-7	diethyl ether	74.1	X		Y	Y	Y	Y	N	Y	N	N	N	Y	
84-66-2	diethyl phthalate	222.2		X	N	N	N	N	NE	Y	N	N	N	Y	
84-74-2	di-n-butyl phthalate	278.3		X	N	N	N	N	NE	Y	N	N	N	Y	
122-39-4	diphenylamine	169.2		X	N	N	N	N	NE	Y	N	N	N	Y	
74-84-0	ethane	30.1	X	X	Y	Y	Y	Y	Y	N	N	N	N	N	
64-17-5	ethanol	46.1		X	N	N	N	N	Y	N	N	N	N	N	
74-85-1	ethene	28.1	X	X	NE	NE	NE	NE	NE	N	N	N	N	N	
85-98-3	ethyl centralite	268.4		X	N	N	N	N	NE	N	N	N	N	N	
100-41-4	ethylbenzene	106.2	X	X	Y	N	N	N	Y	Y	Y	Y	Y	Y	
505-60-2	HD	159.1	X	X	Y	N	N	N	Y	Y	Y	Y	Y	Y	
87-68-3	hexachlorobutadiene	260.8	X		NE	NE	NE	NE	N	Y	Y	Y	N	Y	
67-72-1	hexachloroethane	236.7	X	X	NE	NE	NE	NE	NE	Y	Y	Y	Y	Y	
110-54-3	hexane	86.2	X		Y	N	N	N	Y	N	N	N	Y	Y	
74-82-8	methane	16.0	X	X	NE	NE	NE	NE	Y	N	N	N	N	N	
1634-04-4	methyl tert-butyl ether	88.2	X		Y	N	N	N	N	Y	Y	Y	Y	N	
75-09-2	methylene chloride	84.4	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
141-43-5	monoethanolamine	61.1		X	N	N	N	N	Y	N	N	N	N	N	
91-20-3	naphthalene	128.2	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
98-95-3	nitrobenzene	123.1		X	N	N	N	N	Y	Y	Y	Y	N	Y	
55-63-0	nitroglycerin	227.1		X	N	N	N	N	NE	Y	N	Y	N	Y	
111-65-9	octane	114.2	X		Y	N	N	N	N	N	N	N	N	N	
109-66-0	pentane	72.2	X		Y	N	N	N	N	Y	N	N	Y	N	
85-01-8	phenanthrene	178.2		X	N	N	N	N	Y	N	N	N	N	N	
108-95-2	phenol	94.1		X	N	N	N	N	Y	Y	N	N	Y	Y	
115-07-1	propene	42.1	X		Y	N	N	N	N	Y	Y	N	N	Y	
100-42-5	styrene	104.2		X	N	N	N	N	Y	Y	N	N	Y	Y	
75-65-0	tert-butyl alcohol	74.1	X		Y	N	N	N	N	N	N	N	N	N	

Y = yes; N = no; NE = not expected (This COPC is considered a Subgroup 7C COPC and is not expected to be emitted but is being carried through the MPHRA at this time.)

Table A-5. Chemicals Generated During Treatment of HD/HT and Potential Emission Points Before Controls (continued)

CAS No.	Compound Name	MW	COPCs		Emitted in a Process Gas Stream?					Toxicity data available?	Toxicity Data				
			PCAPP	EDS	Agent Filter Area (AFA)	30-day Hydrolysate Storage Tanks	Bio-Treatment (BTA)	Brine Reduction System (BRS)	EDS		Cancer		Non-cancer		
											Inh.	Oral	Inh.	Oral	
92-24-0	tetracene	228.3	X	N	N	N	N	NE	N	N	N	N	N	N	
127-18-4	tetrachloroethene	165.8	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
479-45-8	tetryl	287.2	X	N	N	N	N	N	NE	Y	N	N	N	Y	
420-12-2	thiirane	60.1	X	Y	Y	Y	Y	Y	N	N	N	N	N	N	
111-48-8	thiodiglycol	122.2	X	X	Y	Y	Y	Y	NE	Y	N	N	N	Y	
108-88-3	toluene	92.1	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
156-60-5	trans-1,2-dichloroethene	96.9	X	N	N	N	N	N	Y	Y	N	N	N	Y	
79-01-6	trichloroethene	131.4	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
75-01-4	vinyl chloride	62.5	X	X	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
1330-20-7	xylenes	106.2	X	X	Y	Y	Y	Y	Y	Y	N	N	Y	Y	
7429-90-5	aluminum	27.0	X	N	N	N	N	N	Y	Y	N	N	Y	Y	
7664-41-7	ammonia	17.0	X	X	N	N	Y	Y	Y	Y	N	N	Y	N	
7440-38-2	arsenic, inorganic	74.9	X	N	N	N	N	N	Y	Y	Y	Y	Y	Y	
7440-43-9	cadmium	112.4	X	N	N	N	N	N	Y	Y	Y	Y	Y	Y	
7782-50-5	chlorine	70.9	X	Y	N	N	N	N	N	Y	N	N	Y	Y	
7440-50-8	copper	63.5	X	N	N	N	N	N	Y	Y	N	N	N	Y	
7647-01-0	hydrogen chloride	36.5	X	X	Y	N	N	N	NE	Y	N	N	Y	N	
74-90-8	hydrogen cyanide	27.0	X	N	N	N	N	N	Y	Y	N	N	Y	Y	
7439-92-1	lead	207.2	X	N	N	N	N	N	Y	Y	Y	Y	N	N	
7440-02-0	nickel	58.7	X	N	N	N	N	N	NE	Y	Y	Y	Y	Y	
7440-22-4	silver	107.9	X	N	N	N	N	N	Y	Y	N	N	N	Y	

Y = yes; N = no; NE = not expected (This COPC is considered a Subgroup 7C COPC and is not expected to be emitted but is being carried through the MPHRA at this time.)

Table A-6. Chemicals of Potential Concern

CAS No.	Compound Name	COPCs	PCAPP	EDS	Toxicity Data		
					Chronic		Acute
					Cancer	Noncancer	Inhalation
630-20-6	1,1,1,2-tetrachloroethane	1	1	1	✓	✓	✓
71-55-6	1,1,1-trichloroethane	2	2	2		✓	✓
79-34-5	1,1,2,2-tetrachloroethane	3	3	3	✓	✓	✓
75-34-3	1,1-dichloroethane	4	4		✓	✓	✓
75-35-4	1,1-dichloroethene	5	5	4		✓	✓
87-61-6	1,2,3-trichlorobenzene	6	6			✓	✓
120-82-1	1,2,4-trichlorobenzene	7	7	5	✓	✓	✓
95-63-6	1,2,4-trimethyl benzene	8	8			✓	✓
13105-10-7	1,2-bis(ethylthio)-ethene	9	9				
63938-34-1	1,2-bis(vinylthio)-ethane	10	10				
95-50-1	1,2-dichlorobenzene	11		6		✓	✓
616-21-7	1,2-dichlorobutane	12	11				
107-06-2	1,2-dichloroethane	13	12	7	✓	✓	✓
78-87-5	1,2-dichloropropane	14	13		✓	✓	✓
541-73-1	1,3-dichlorobenzene	15		8			✓
106-46-7	1,4-dichlorobenzene	16		9	✓	✓	✓
123-91-1	1,4-dioxane	17	14		✓	✓	✓
505-29-3	1,4-dithiane	18	15	10		✓	
15980-15-1	1,4-oxathiane	19	16	11			✓
109-69-3	1-chlorobutane	20	17			✓	✓
592-41-6	1-hexene	21	18				✓
3772-13-2	2,2-dimethyl-trans-thiirane	22	19				
632-16-6	2,3-dimethyl-thiophene	23	20				
118-96-7	2,4,6-trinitrotoluene	24		12	✓	✓	✓
120-83-2	2,4-dichlorophenol	25		13		✓	✓
121-14-2	2,4-dinitrotoluene	26		14	✓	✓	✓
606-20-2	2,6-dinitrotoluene	27		15	✓	✓	✓
78-93-3	2-butanone	28	21	16		✓	✓
78-86-4	2-chlorobutane	29	22	17			✓
112-26-5	2-chloroethoxyethane	30	23				✓
3404-63-5	2-ethyl 1,3-butadiene	31	24				
591-78-6	2-hexanone	32	25			✓	✓
95-48-7	2-methyl phenol	33		18		✓	✓
5616-51-3	2-methyl-1,3-dithiacyclopentane	34	26				
6007-26-7	2-methyl-1,3-dithiane	35	27				
17642-74-9	2-methyl-1,3-oxathiolane	36	28				
91-57-6	2-methylnaphthalene	37		19		✓	✓
108-39-4	3-methyl phenol	38	29	20		✓	✓
106-44-5	4-methyl phenol	39	30	21		✓	✓
108-10-1	4-methyl-2-pentanone	40	31			✓	✓
208-96-8	acenaphthylene	41		22			✓
75-07-0	acetaldehyde	42	32		✓	✓	✓
67-64-1	acetone	43	33	23		✓	✓
74-86-2	acetylene	44		24			✓
107-02-8	acrolein	45	34			✓	✓
98-83-9	alpha-methylstyrene	46	35			✓	✓
71-43-2	benzene	47	36	25	✓	✓	✓
108-60-1	bis(2-chloroisopropyl) ether	48		26	✓	✓	
75-15-0	carbon disulfide	49	37	27		✓	✓
108-90-7	chlorobenzene	50		28		✓	✓
75-00-3	chloroethane	51	38			✓	✓
67-66-3	chloroform	52	39	29	✓	✓	✓
74-87-3	chloromethane	53	40			✓	✓
3188-13-4	chloromethoxyethane	54	41				
156-59-2	cis-1,2-dichloroethene	55		30		✓	✓
75-71-8	dichlorodifluoromethane	56		31		✓	✓
60-29-7	diethyl ether	57	42			✓	✓
84-66-2	diethyl phthalate	58		32		✓	✓
84-74-2	di-n-butyl phthalate	59		33		✓	✓

Table A-6. Chemicals of Potential Concern (continued)

CAS No.	Compound Name	COPCs	PCAPP	EDS	Toxicity Data		
					Chronic		Acute
					Cancer	Noncancer	Inhalation
122-39-4	diphenylamine	60		34		✓	✓
74-84-0	ethane	61	43	35			✓
64-17-5	ethanol	62		36			✓
74-85-1	ethene	63	44	37			✓
85-98-3	ethyl centralite	64		38			
100-41-4	ethylbenzene	65	45	39	✓	✓	✓
505-60-2	HD	66	46	40	✓	✓	✓
87-68-3	hexachlorobutadiene	67	47		✓	✓	✓
67-72-1	hexachloroethane	68	48	41	✓	✓	✓
110-54-3	hexane	69	49			✓	✓
74-82-8	methane	70	50	42			✓
1634-04-4	methyl tert-butyl ether	71	51		✓	✓	✓
75-09-2	methylene chloride	72	52	43	✓	✓	✓
141-43-5	monoethanolamine	73		44			✓
91-20-3	naphthalene	74	53	45	✓	✓	✓
98-95-3	nitrobenzene	75		46	✓	✓	✓
55-63-0	nitroglycerin	76		47	✓	✓	✓
111-65-9	octane	77	54				✓
109-66-0	pentane	78	55			✓	✓
85-01-8	phenanthrene	79		48			✓
108-95-2	phenol	80		49		✓	✓
115-07-1	propene	81	56			✓	✓
100-42-5	styrene	82		50		✓	✓
75-65-0	tert-butyl alcohol	83	57				✓
92-24-0	tetracene	84		51			
127-18-4	tetrachloroethene	85	58	52	✓	✓	✓
479-45-8	tetryl	86		53		✓	✓
420-12-2	thiirane	87	59				
111-48-8	thiodiglycol	88	60	54		✓	✓
108-88-3	toluene	89	61	55		✓	✓
156-60-5	trans-1,2-dichloroethene	90		56		✓	✓
79-01-6	trichloroethene	91	62	57	✓	✓	✓
75-01-4	vinyl chloride	92	63	58	✓	✓	✓
1330-20-7	xylenes	93	64	59		✓	✓
7429-90-5	aluminum	94		60		✓	✓
7664-41-7	ammonia	95	65	61		✓	✓
7440-38-2	arsenic, inorganic	96		62	✓	✓	✓
7440-43-9	cadmium	97		63	✓	✓	✓
7782-50-5	chlorine	98	66			✓	✓
7440-50-8	copper	99		64		✓	✓
7647-01-0	hydrogen chloride	100	67	65		✓	✓
74-90-8	hydrogen cyanide	101		66		✓	✓
7439-92-1	lead	102		67	✓		✓
7440-02-0	nickel	103		68	✓	✓	✓
7440-22-4	silver	104		69		✓	✓

✓ = Indicates toxicity data are available for the COPC and the listed effect.

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